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WIRELESSS NETWORK AND METHODS TO BE USED THEREIN

Abstract:

Abstract of WO0042791

The invention is concerned with a modular wireless network architecture comprising one or more modular wireless terminals, one or more modular base stations, a public network and service providers. The modularity is concerned with intelligent functions for establishing one or more radio connections between the modular wireless terminal and a modular base station, and for allowing the modular wireless terminals to be directly connected to the public network via a modular base station. The invention is also concerned with methods in such networks for establishing different connections. e88

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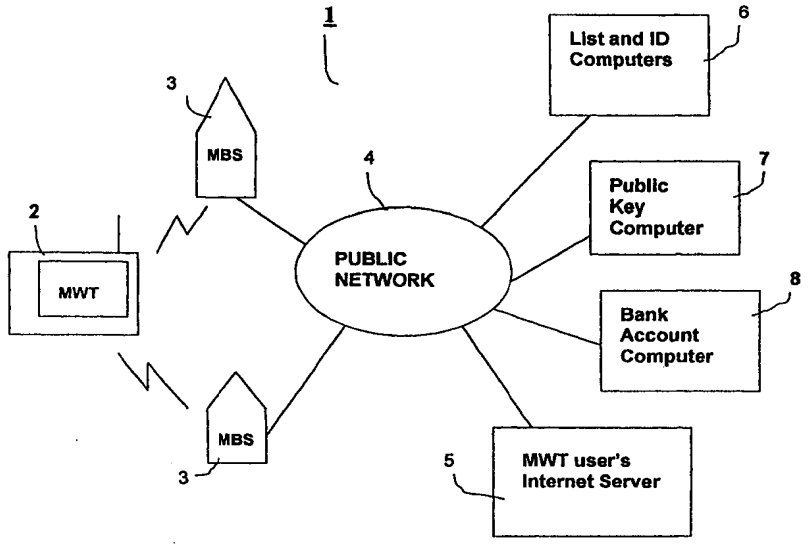

(57) Abstract

The invention is concerned with a modular wireless network architecture comprising one or more modular wireless terminals, one or more modular base stations, a public network and service providers. The modularity is concerned with intelligent functions for establishing one or more radio connections between the modular wireless terminal and a modular base station, and for allowing the modular wireless terminals to be directly connected to the public network via a modular base station. The invention is also concerned with methods in such networks for establishing different connections.

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WIRELESS NETWORK AND METHODS TO BE USED THEREIN

TECHNICAL FIELD

The invention is concerned with a wireless network and methods for providing services in a wireless communication network, comprising one or more mobile terminals, one or more base stations, a public network, and service providers.

BACKGROUND ART

A mobile telecommunications system consists of several areas served by a base station. All base stations of a system is controlled by a Base Station Center (BSC), which in turn communicates via a Mobile Switching Center (MSC), which connects the call to another MSC, A NMT centre, a fixed network centre, etc. In such systems a mobile station communicates with another station or server via the closest base station. The BSC directly connect a call to the base station controlled by it. The BSC, in turn, communicates via a Mobile Switching Centre (MSC) and, depending on the case, other elements in the network, like a Home Location Centre (HLR), Visitor Location Centre (VLR), Equipment Identification Register (EIR) and an Authentication Centre (AUC). The network can also comprise a Short Message System Centre (SMSC) and a Voice Message System (VMS).

A telecommunication network can consist of a fixed core network and a radio network. The administrators of a telecommunication network are called operators and they offer the services needed for the communication in the network, which, in addition to transport services, like radio channels, usually even consist of other communication services, such as speech, data, video and multimedia and the services. There are also other service providers than the operators offering different services. These services are sent from the core network. Mobile stations belonging to the radio network part of the telecommunication network can make use of such

services via radio channels. The requirements on the radio channel depend on the service used. Services like speech do not require a high bit rate, but a high reliability, whereas reliability is important for e.g. data messages. Video services need a high bit rate for the transmission. The information can furthermore be sent either as circuit mode or packet mode. In the future, different types of services will be transmitted in the same network.

The communication through the computer and telecommunications networks is carried out in accordance with rules, called protocols. TCP/IP is an example of a set of protocols for packet mode used over the Internet, which is the world wide network connecting different networks in the whole world.

Cellular systems of today has began to make use of packet data based type of transmission. The TCP/IP protocol suite is used for such packet data infrastructure for using different application services provided by different service providers. Examples of services are voice, E-mail, bank services, data bases, Internet browsing, radio data transfer and video conferencing. Communication services between different systems can be used by means of applications. By standardized applications, data can be changed in different systems in a simple way.

Services provided to mobile terminals through the Internet requires a connection to the core network. For example, in GSM, the Internet connection is created as a so called data connection. In a normal data connection, the same transfer capacity is preserved as in a normal call, in other words, one possible channel. The mobile station needs a modem, which adapts the data to the GSM network and the network forms a connection to another modem, which is connected to a network server, which is in connection to the public network.

Examples of prior art solutions, wherein a mobile station can make use of the public network (Internet), via a modem and the existing GSM network are described in the patent publications EP 883266, US 5,325,362, EP 889660 and EP 910198.

Different applications sent across the interface between the core network and the radio access network require different radio transport services. The performance of the application depends on e.g. bandwidth, quality of service, bit rate etc.

The existing mobile systems, for example GSM, can not meet needs in establishing the channels, when it is question about different kinds of services, since GSM can only offer a very limited transfer capacity for the mobile stations. The GSM system offers only one kind of a channel for speech. Third and forth generation mobile communication systems will have infrastructures for providing different services. There is not yet any standardized concepts for the above kind of services being distributed in a global network and thus there is a need for flexible concepts for providing services for mobile stations.

The object of the invention is to develop systems that are able to use public networks, such as, Internet, without the necessity of connecting through the core network and without the need of a huge amount of network elements to be used when using different services.

SUMMARY OF THE INVENTION

The wireless network of the invention is mainly characterized in that it has functions for establishing one or more radio connections between a modular wireless terminal and a modular base station, and for allowing the modular wireless terminals to be directly connected to the public network via a modular base station.

In the method of the invention a communication is defined at a modular wireless terminal that is intended to be initiated between the wireless modular terminal and the public network. For this purpose the modular wireless terminal asks for parameters from a modular base station to define a radio connection between the modular wireless terminal and the modular base station for said communication. Parameters are then selected at the wireless modular terminal to define a radio

connection between the modular wireless terminal and the modular base station for said communication in accordance with given criteria. The modular base station might check that the mobile terminal has the right to the desired communication, in which case no connection is established if the modular wireless termianl is not authorized. The desired connection is established by the modular base station when the modular wireless terminal has chosen the parameters and the modular base station connects the modular wireless terminal to the public network.

The method of the invention can make use of intelligent Modular Wireless terminals (MWT), which have been given the function to control the radio connection with Modular Base Stations (MBS) thus being able to dynamically allocate transfer capacity as well as roaming functions.

The term "Modular" in this context is used for the elements of the invention to illustrate the intelligent functions they have compared with corresponding prior art elements.

The MWT terminals have thus more functionality than the prior art terminals used in for example GSM. The MWT terminals command roaming and channel allocation using available resources in MBS. Connections can be optimized by the MWT with respect to cost, transfer capacity, reliability, and/or operator, depending on the service to be used, pre-selected cost, reliability and performance criteria, etc. The MBS might also send parameters that are not supported by MWT. The MBS can also send a parameter by its own initiative, when the value of the parameter is changed.

The pre-selected criteria might include a possibility to restrict certain users to given operators for example in accordance with contracts.

The major functions of the MBS is to offer standard connection and communication protocols (such as TCP/IP) to MWT via air interface (the air interface itself is not restricted), and, in preferable embodiments of the invention, to establish the connection in accordance with the order from the MWT. Other functions of the MBS

in preferable embodiments of the invention are payment control, authentication and encryption functions. The communication can be encrypted, for example by public algorithms (public key encryption) through the public network, such as Internet. Using public key encryption in mobile communication enables the MWT terminals to choose and change the keys used.

Furthermore, MBS have functions to allocate capacity to defined users or groups or needs and it can use user priorities. It can also reserve space for small transfer rate as voice connections. Prioritized groups might be emergency situations or willingness to serve voice customers or own customers.

Costs can be paid by using money card or on-line payment. Charging can be carried out directly from customers account or card and the cost transfer to the operator's account. Thus MBS transfer costs directly to the operators and all used capacity (services) will be immediately charged. This simplifies operator's network remarkably, since it's main function is to offer transfer capacity.

Network connection in the form of existing transfer capacity and used hardware modules (transmitters-channels) determine the available capacity for the MBS, which is informed to the MWT upon request. The available capacity as well as other information with respect to the connection between MWT and MBS might vary in accordance with traffic situations and other factors and the MBS have functions to notify the transfer capacity and other changing information, like prices, to MWT to be selected by MWT.

The invention offers a new concept for wireless telecommunication networks. It presents an inventive use of the public network, primarily internet, as a part of the Modular Wireless Network (MWN) of the invention by using existing technologies. The MWC (Modular Wireless Concept) of the invention differs from existing wireless networks, like GSM, in that it uses a simple, open architecture for providing the services by connecting Modular Wireless Terminals (MWT) and Modular Base Stations (MBS) with the public network (in first hand Internet) in a new direct way by

using standard protocols. This kind of an architecture makes wireless network construction more flexible and cheaper. The presently used GSM network has many different network elements. The MWC of the invention can replace most of them by providing public network services in a simple way. Standard interfaces and protocols make it possible to construct a network that suit well to the public network (today Internet) technology.

Benefits of the invention are also that operators do not need expensive and complicated traditional networks with a huge amount of network elements. For example the GSM network has many network elements as MSC (Mobile Switching Centers), HLR (Home Location Registers), VMS (Voice Message system) and SMSC (Short Message System Center). The network architecture of the invention might only contain MWT and MBS connected to a public network, like Internet, which means cost savings.

The Modular Wireless Network (MWN) of the invention is open for several different sized operators. The operators can further offer own network (wider cover) but they need less operational staff on site, since a part of the functionality has been given to the MWT and MBS. The MWN is easy to expand from a MBS to the world wide network. Standard interfaces and modular structures make it flexible and it suites well for price competition.

The customers only need an user identification (ID) like an e-mail address for communication and using of services in the network of the invention. Each client needs an unique identification. When using Internet, it can be an E-mail address. When desired, the address can be converted to a list and ID in the computer. This data base corresponds to AUC and EIR functions of GSM.

The invention is described in the following by means of figures and a block scheme. This detailed description is for illustrative purposes only and is not intended to restrict the invention in any way. For example the servers mentioned are only examples as well as protocols mentioned.

BRIEF DESCRIPTION OF DRAWINGS

Figure 1 illustrates the MWC network architecture of the invention.

Figure 2 is a block scheme of the method of the invention.

DETAILED DESCRIPTION

Figure 1 illustrates the MWC network architecture 1 of the invention from a wireless point of view. The network includes wireless components as modular wireless terminals 2 and modular base stations 3. The public network (Internet) 4 connects all the components together. Service computers own by service providers that give services to users can also be connected to the public network 4 via standard connection and network protocol, usually TCP/IP. Such service computers are in figure 1 represented by a single reference number 5. Especially illustrated in figure 1 is a List and ID computer 6, which maintain a register of device users as explained above, a Public Key Computer 7, that gives public encryption keys for users (The data base of public keys contains the public key of each user. The key can be changed according to the invention by MWT and if desired, this can be made to happen automatically. Also the length of the key can be changed if the security level so requires and the MWT and MBS accept the change, i.e. there is enough power for that) and a Bank Account Computer 8, by means of which the costs can be paid by money card or directly in real-time on-line payment from users account (card) to operator's account (The user can make use of a smart card, wherein there, in additions to the functions corresponding to the SIM card of GSM are bank card/credit card functions).

The radio connection between a modular wireless terminal 2 and a modular base station 3 is established by means of standard protocols. The difference between the establishment of a radio channel in prior art solutions and the establishment of the connection in the invention is that, the modular wireless terminal 2 itself can define

the connection among available parameters given by the modular base 3 station. The connection between the modular base station 3 and the public network 4 is established directly by standard protocols, like TCP/IP without the need of any additional network elements. Also the connection between the different public network servers 5,6,7,8 and the public network is established by means of standard protocols like TCP/IP.

Figure 2 is a block scheme of the method of the invention to be used in the MWC network of the invention. Let us assume that a mobile terminal of the invention (MWT) desires to make use of a public network service. It defines the communication (step 1 of figure 2) which might be a telephone service (voice), a video request, a bank service, a data service or whatever service an Internet Server might offer.

The MWT has a radio link to a modular base station of the invention (MBS). The MWT then asks for available parameters from the MBS through the radio connection to define a radio connection through which the communication service in question can be transmitted. Parameters defining the channel might be cost factors, transfer capacity, bandwidth, bit rate, operator, reliability etc. The MBS gives the available parameters to the MWT (step 2 of figure 2). The available parameters might depend on e.g. the traffic situation, user priorities, operator priorities, service priorities etc.

The MWT makes an optimal combination of the parameters given according to pre-selected criteria and defines the radio channel to be used (step 3 of figure 2).

In a preferred embodiment of the invention, MBS checks if the MWT is authorized (step 4 of figure 2) and uses a server with a list of allowable MWT devices. If the MWT in question is not allowed (according to step 5 of figure 2), no radio channel is established (step 6 of figure 2). If the MWT is allowed, the MBS connects the MWT to the Public network and establish a radio channel (step 7 of figure 2) and the communication can take place (step 8 of figure 2). The MBS might inform MWT about changed parameters during an ongoing call. In case of such a message, the

MWT decides (step 9 of figure 2), whether to define a new connection and go back to step 3 or to continue using the same (step 10 of figure 2).

The invention can be used both in originating calls from MWT, explained above as well as in terminating calls to MWT and roaming situations.

In an example of an incoming call to MWT from an IP phone, another MWT, GSM, online service provider etc. There are different possibilities to route the call to the MWT. If the protocols in use do not support the routing, the call begins with a connection request from the caller to MWT's public network server The server then forward the request to the MBS in which the MWT is registered. Another possibility is to use a router, which has information about the routing to be made. A third possibility is to make use of a protocol that supports the routing, such as Ipv6, in which case a direct contact to the MWT can be made.

If the received call is to be charged by MBS (operator), MBS checks that the MWT has funds (money card or account),). MBS then reserves, the needed capacity, preferably chosen by MWT, (or keeps a capacity already established or add capacity to an existing capacity). MBS accepts the connection. (MWT might refuse to take the incoming call) .MWT then gets the new connection and is ready to use the reserved capacity.

In an example of a roaming situation (the roaming might be optional), when a MWT change to a new MBS, the MWT choose the new MBS using defined rules: price, transfer, capacity, operator, reliability. The new MBS makes the same checks as in the case with an originating call from MWT. MWT then command the new MBS to reserve needed transfer capacity and to establish the new connection. The MWT requests the connected services to route public network protocol packets to new MBS. The MWT then command the present MBS to close the connection. The present MBS charge user's money card or bank account. The roaming is invisible for MWT applications. Thus, in the invention, the charging can be carried out separately

by each MBS, whereas, for example in GSM, it is the network that makes the charging.

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CLAIMS

1. Modular wireless network architecture comprising one or more modular wireless terminals, one or more modular base stations, a public network and service providers, c h a r a c t e r i z e d in that it has functions
for establishing one or more radio connections between the modular wireless terminal and a modular base station, and for
allowing the modular wireless terminals to be directly connected to the public network via a modular base station.

2. Modular wireless network of claim 1, c h a r a c t e r i z e d in that the communication between the modular base stations and the public network takes place with standard protocols, such as TCP/IP.

3. Modular wireless network of claim 1 or 2, c h a r a c t e r i z e d in that the modular base station has functions to send available parameters for forming a radio connection to the wireless terminal between the modular wireless terminal and the modular base station.

4. Modular wireless network of claim 3, c h a r a c t e r i z e d in that the modular wireless terminal has functions to define a radio connection between the modular wireless terminal and the modular base station by means of the parameters given by the modular base station.

5. Modular wireless network of claim 4, c h a r a c t e r i z e d in that the modular base station has functions to establish a radio connection between the modular wireless terminal and the modular base station defined by the modular wireless terminal.

6. Wireless network of any of claims 1 - 5, c h a r a c t e r i z e d in that the service providers have servers which are bank account computers, list and ID computers, public key computers and other Internet service servers.

7. Method for providing services in a modular wireless communication network, comprising one or more modular wireless terminals, one or more modular base stations, a public network, and service providers, c h a r a c t e r i z e d by the following steps being performed,

a) defining a communication at a modular wireless terminal intended to be initiated between the wireless modular terminal and the public network,

b) the modular wireless terminal asking for parameters from a modular base station to define a radio connection between the modular wireless terminal and the modular base station for said communication,

c) selecting the parameters at the wireless modular terminal to define a radio connection between the modular wireless terminal and the modular base station for said communication in accordance with given criteria,

d) optionally, checking at the modular base station that the mobile terminal has the right to the desired communication,

e) establishing the desired connection at the modular base station,

f) the modular base station connecting the modular wireless terminal to the public network.

8. Method of claim 7, c h a r a c t e r i z e d in that in step b) a modular base station is chosen by the modular wireless terminal in accordance with pre-selected rules concerned with prices, operator, transfer capacities and such factors.

9. Method of claim 8, c h a r a c t e r i z e d in that, the parameters for forming the radio connection in step b) are concerned with the cost, the transfer capacity needed, the reliability, and/or the concerned operator etc.

10. Method of claim 9, c h a r a c t e r i z e d in that the available parameters given by the modular base station depends on the radio network traffic situation.

11. Method of claim 10, c h a r a c t e r i z e d in that the parameters given by the modular base station depends on the radio network traffic situation, in which case

the modular base station might give the parameters depending on user and/or service priorities.

12. Method of claim 11, c h a r a c t e r i z e d in that the parameters given by the modular base station depends on pre-selected rules for selecting parameters for the base station and the modular wireless terminal.

13. Method of any of claims 7 - 12, c h a r a c t e r i z e d in that the criteria according to which the modular wireless terminal selects a connection in step c) are individually chosen in each terminal according to which the terminal chooses an optimal connection.

14. Method of any of claims 7 - 13, c h a r a c t e r i z e d in that the communication is encrypted between MBS and MWT by means of public keys changeable by MWT.

15. Method of any of claim 7 - 14, c h a r a c t e r i z e d in that step d), the checking is carried out by means of authentication functions

16. Method of claims 15, c h a r a c t e r i z e d in that the authentication functions are Hardware functions.

17. Method of claim 15, c h a r a c t e r i z e d in that the authentication is carried out by using public network authentication servers, like the ID and list server.

18. Method of any of claims 7 - 17, c h a r a c t e r i z e d in that the modular base station has functions for charging the mobile wireless modular terminal directly in real-time by on-line charging or smart card.

19. Method of any of claims 7 - 18, c h a r a c t e r i z e d in that the communication between the modular wireless terminal and the public network consists of using bank servers or other public network servers.

20. Method of any of claims 7 - 19, c h a r a c t e r i z e d in that the public network is internet.

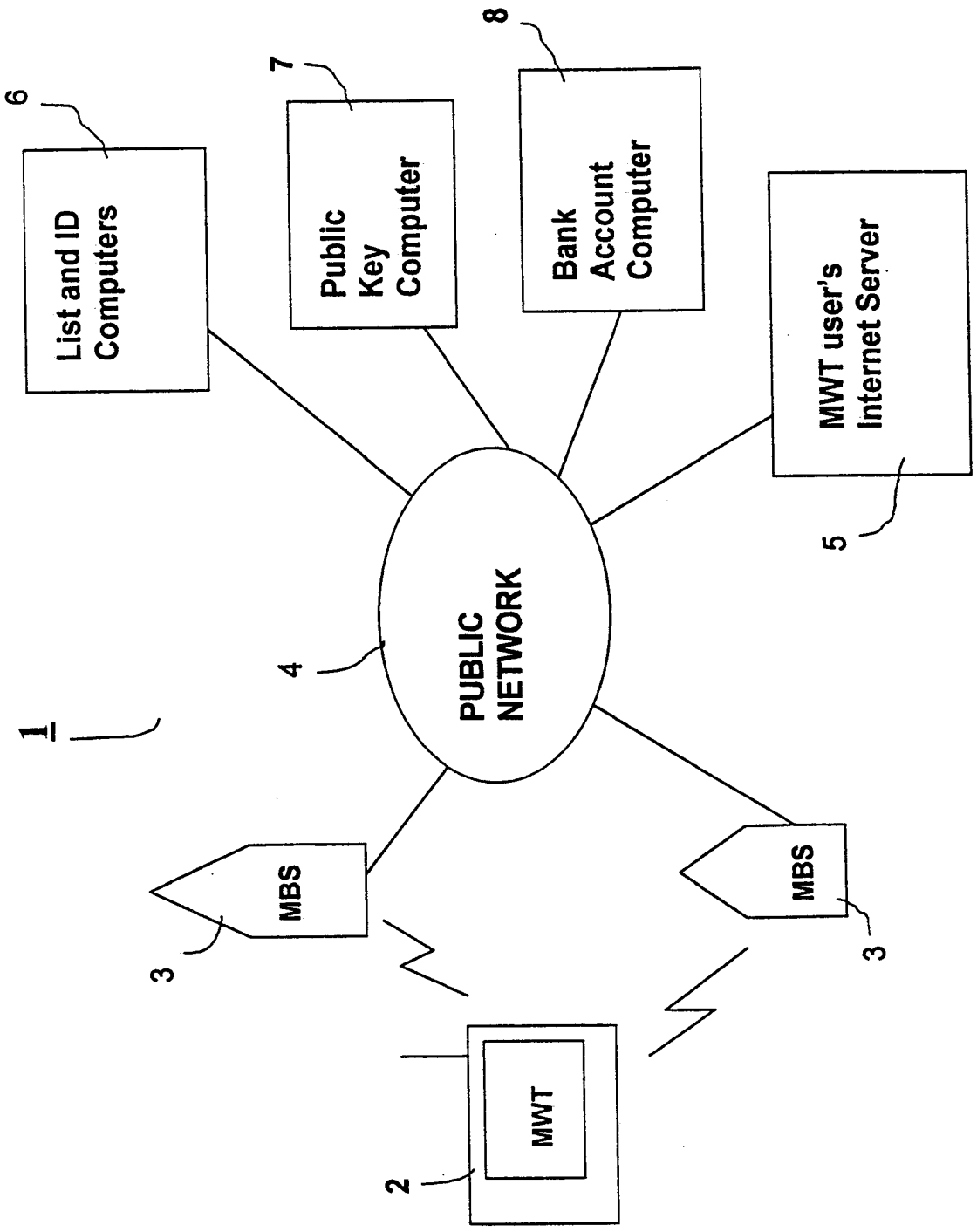
1
PUBLIC NETWORK
4
List and ID Computers
6
Public Key Computer
7
Bank Account Computer
8
MWT user's Internet Server
5
MBS
3
MBS
3
MWT
2

FIG. 1

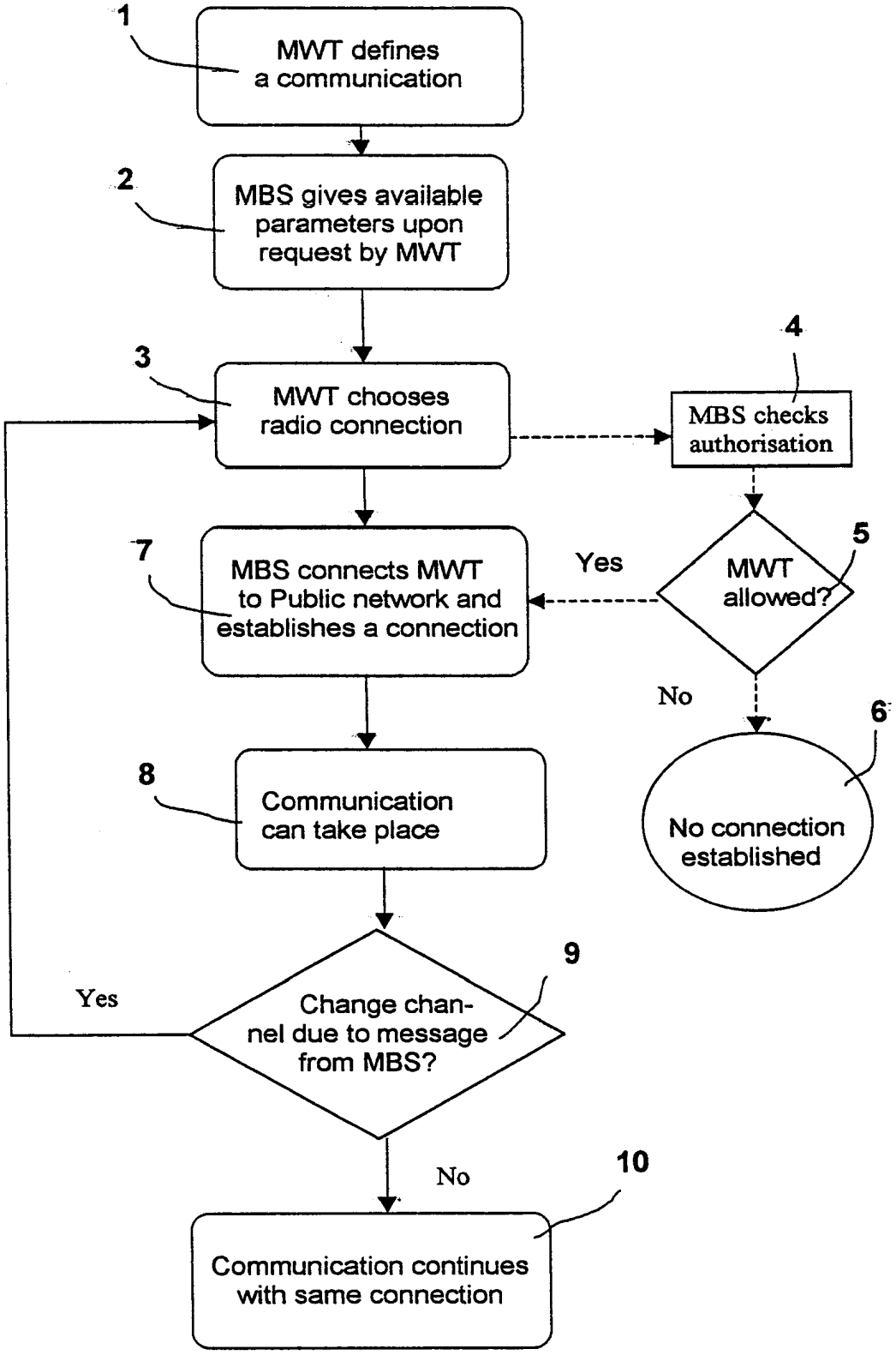
1
MWT defines a communication
2
MBS gives available parameters upon request by MWT
3
MWT chooses radio connection
4
MBS checks authorisation
5
MWT allowed?
Yes
No
7
MBS connects MWT to Public network and establishes a connection
6
No connection established
8
Communication can take place
9
Change channel due to message from MBS?
Yes
No
10
Communication continues with same connection

FIG. 2

INTERNATIONAL SEARCH REPORT

International application No
PCT/FI 99/00889

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04Q7/24 H04Q7/32

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04Q H04M H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 889 660 A (IBM) 7 January 1999 (1999-01-07) page 3, line 28 -page 4, line 45; claims 1-9 abstract	1-9,13, 15-17, 19,20
A		10-12, 14,18

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

Internation pplication No
PCT/FI 99/00889

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 98 57508 A (TELIA AB) 17 December 1998 (1998-12-17) page 1, line 25 -page 2, line 4 page 2, line 14 -page 6, line 22; claims 1-7; figure 1 abstract	1,3-5,7, 13, 15-17,20
A		2,6, 8-12,14, 18,19

X	SE 9 801 871 A (TELIA ABX) 28 November 1999 (1999-11-28) abstract; figure 1 (Cat. E)	1,6
A		2-5,7-20

X	EP 0 987 860 A (MITSUBISHI MATERIALS CORP) 22 March 2000 (2000-03-22) page 2, line 25 - line 49 page 3, line 36 -page 6, line 35; claims 1-25; figures 3-6,11 abstract (Cat. E)	1,3-7, 13, 15-17, 19,20
A		2,8-12, 14,18

A,P	WO 99 43133 A (NOKIA TELECOMMUNICATIONS OY) 26 August 1999 (1999-08-26) page 1, line 16 -page 4, line 36; claims 1-14; figure 9 abstract	1-20

A,P	WO 99 31855 A (ERICSSON TELEFON AB L M) 24 June 1999 (1999-06-24) page 2, line 27 -page 3, line 17; claims 1-18; figure 2 abstract	1-20

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